



Australian Government
Department of Agriculture
and Water Resources



GOVERNMENT OF
WESTERN AUSTRALIA



NORTHERN
TERRITORY
GOVERNMENT



Queensland
Government

Significant Disease Investigation Guide



Biosecurity – it's everyone's business

Australia is free from many exotic pests and diseases that have the potential to devastate our livestock industry and pose a risk to human health.

Your role in the biosecurity system is critical to help protect the health of people, livestock, and native animals by reporting and investigating significant disease events.

This guide aims to help you decide when to initiate a significant disease investigation, and outlines the process you need to follow. Disease information has been arranged by syndrome for ease of use in the field.

The Northern Australia Biosecurity Surveillance Project is part of the Australian Government's Agricultural Competitiveness White Paper, the government's plan for stronger farmers and a stronger economy.



Northern Australia Biosecurity Surveillance – Significant Disease Investigation Network

The NABS Significant Disease Investigation (SDI) Network will support eligible investigations of disease events in livestock. An SDI must meet the following criteria:

The property or area must be located within the Northern Territory, or north of the Tropic of Capricorn in Western Australia and Queensland.

- The disease must affect farmed cattle* where:
 - multiple animals or species are affected or
 - the issue is unusual and ongoing or
 - the presenting signs may indicate an Emergency Animal Disease (EAD) or be clinically similar to priority animal diseases for northern Australia***
- A veterinarian must conduct a full investigation, including completing a case history and submitting laboratory samples.
- The veterinarian has signed up as part of a NABS SDI

Practice Package** or the case approved by contacting the SDI co-ordinator in the relevant jurisdiction.

- * For disease in other species, eligibility for this program will be considered on a case-by-case basis
- ** If you are not part of the SDI Practice Package, please contact the SDI co-ordinator for your state.
- *** See next page for guidance on what to do if you have a genuine suspicion of an EAD



Genuine suspicion of an EAD?

Report immediately if you see, with no apparent plausible explanation:

- cloven-hooved animals that have ulcers, erosions or blisters around the feet, muzzle, udder or mouth
- cloven-hooved animals that are lame and drooling or salivating excessively
- unusual nervous system signs in any species
- multiple deep, fly-struck wounds in live animals in northern Australia
- any clinical presentation that a veterinarian believes may be the signs of a Notifiable Disease, exotic or endemic
- abnormal mortality rates in any species, including birds or aquatic animals
- abnormal morbidity rates in any species, including birds or aquatic animals
- rapid spread of disease through a herd or flock
- a disease event where multiple species are affected
- a sudden and unexplained large fall in production.

**EMERGENCY ANIMAL
DISEASE WATCH HOTLINE
1800 675 888**



If you suspect a notifiable disease call the Emergency Animal Disease Watch Hotline immediately. You can also report to the NABS coordinator for your state or territory.





Suspicion of zoonotic disease?

It's important to remember that some diseases have the potential to infect humans as well as animals.

- When investigating a disease outbreak, consider possible zoonotic diseases that could be responsible and take relevant precautions.
- Ensure all people in contact with the animals also take appropriate safety precautions.

Zoonotic disease differentials for syndromes seen in cattle

Syndrome	Disease	Modes of transmission	Precautions at the property
Neurological	Bovine spongiform encephalopathy	Ingestion of material from infected animal	Remove suspect animals from food chain. Wear PPE for post mortem, caution with handling nervous tissue
	Rabies	In saliva via bites/scratches	Extreme care. If bitten, euthanase and test animal - wear PPE for post mortem, caution with handling nervous tissue. Seek post exposure treatment
Reproductive	Bovine brucellosis	Direct contact / ingestion of animal products	Wear PPE for examination of animals
	Leptospirosis	Urine, reproductive fluids	Avoid splashing or inhaling body fluids, wear PPE
Respiratory signs	Bovine tuberculosis	Direct transmission by ingestion, inhalation and instillation	Remove suspect animals from food chain. Wear PPE for post mortem
Skin lesions	Screw worm fly	Flies lay eggs in wounds	Protect wounds from flies
	Ringworm	Direct contact with infected skin	Wear gloves to examine animals. Wash hands and equipment
Sudden death	Anthrax	Direct contact with infected fluids and tissues	Wear PPE for examination of animals, avoid contamination from discharges and avoid opening carcass
	Melioidosis	Direct contact with infected fluids and tissues	Wear PPE for examination of animals, avoid contamination from discharges

What should be collected in the field?



A complete case history - define the features of the problem

- Species – is more than one affected?
- Class of animal affected
 - Breed
 - Age
 - Sex
 - Condition
 - Origin
- Proportion of stock affected
- Clinical signs
- What is the duration of disease?
- What is the recovery time?
- Compare cases and non-cases – what's different?
- What vaccinations or treatments have animals had?
- Consider possible sources of introduction/spread



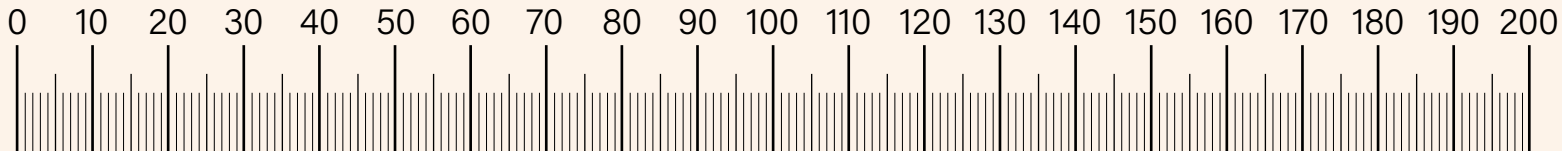
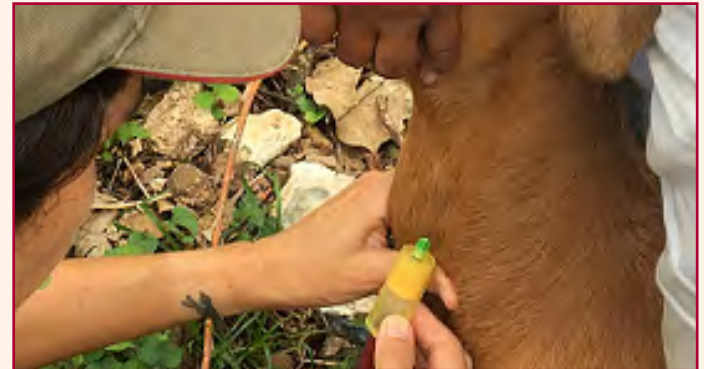
Photographs

- Live and dead animals
- Lesions / pathology



Samples

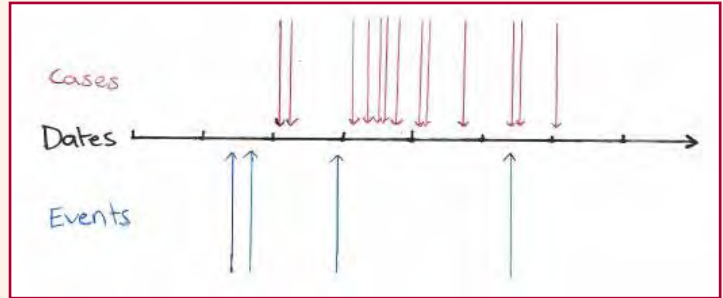
- From affected and healthy animals
- Perform a post mortem
- Check the sample collection guide
- Describe lesions and take measurements
- Be aware of zoonoses – collect carefully and wear PPE





Timeline

- Sequence dates of disease cases and note clusters
 - Find the first case – what happened before it?
 - Note other events that happened on the property within the timeline
 - What's different when cases don't occur?



Details of the location




- Take GPS coordinates if possible
- Address and PIC
- Physical factors
 - Infrastructure
 - Geography
 - Soil
 - Vegetation
 - Water sources
- Photos of layout and significant features
- Spatial map of where cases occurred
 - Identify clusters of cases
 - Overlay geography and infrastructure



Good blood collection

Careful handling of blood samples gives the best chance for thorough investigation and accurate diagnosis.

- Make sure you select the correct tube for the required tests
- Fill blood tubes
- Avoid haemolysis:
 - remove needle before transferring blood from a syringe to a tube
 - leave clot tubes standing upright to clot
 - mix anticoagulant tubes gently
 - allow tubes to cool in esky before refrigeration, don't freeze
 - don't allow tubes to overheat

Tube type	Description		Tests
Serum separation and clot activator Allows the clot to form so serum can be analysed	Gold and red tops or plain glass with red top		Serology Antibody and antigen tests Clinical Biochemistry
EDTA Contains anticoagulant and used for complete blood counts	Purple tops		Haematology Haemoparasite Virus isolation PCR
Lithium heparin Contains anticoagulant	Green tops		Clinical biochemistry Virus isolation

Good tissue sample collection

Careful collection of tissue gives the best chance for thorough investigation and accurate diagnosis

Ensure samples are representative of lesions

- sample the interface with normal tissue

- areas of different colour or consistency
- consider multiple sections for large lesions


Take fresh and fixed tissue samples

- use 10 times as much 10% buffered formalin as tissue
- fixed tissues can be drained before transportation - seal well and add a few millilitres of formalin to moisten tissue

Organ	Sample Size	Don't forget
Liver and spleen	10mm cube (fresh)	Multiple samples of normal tissue and pathology
Kidney	20mm long x 8mm wide (fixed)	Cortex, medulla, pelvis and stones
Heart	50mm cube (fresh liver and kidney for toxicology)	Left and right ventricles, atrium, septum, valves
Lung		Cranio-ventral and dorso-caudal areas
Lymph nodes	Whole lymph node (half fresh and half fixed)	Label container to identify which lymph node
Intestine	25mm long with nicks either end to encourage fixing dilated	Do not scrape or wipe mucosal surfaces that need to be examined
Brain	Whole brain (fresh)	Aseptic swab and impression smear Fixed brain for TSEs and fresh cervical spinal cord



Sample collection guide for syndromes seen in cattle

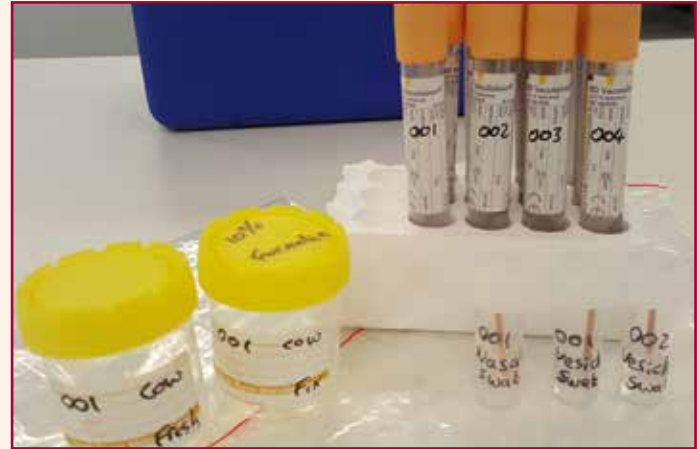
	Blood			Faeces and urine	Priority tissue samples	Other samples
	Clotted	EDTA	Smear			
Ill thrift	✓	✓	✓	✓	Liver, kidney, heart, lung, spleen, GIT, lymph nodes	Any lesions
Neurological	✓	✓	✓		Brain, spinal cord, liver, kidney, heart, skeletal muscle	Rumen and intestinal contents, cerebrospinal fluid, aqueous humour, any lesions
Oral Lesions	✓	✓	✓		Vesicular fluid, epithelium from vesicles, oral, nasal, vesicular and tonsillar swabs in VTM or saline	Spleen, liver, lung, GIT, lymph nodes, any lesions
Reproductive	✓	✓			Aborted foetus and placenta, vaginal mucous or cervical mucous from cow, preputial wash from bull	Uterus from cull cow
Respiratory signs	✓	✓	✓		Lung, trachea, bronchial lymph nodes, pleural fluid, any lesions	Oral and nasal swabs in VTM Bacto swab of lesions in TM
Skin lesions	✓	✓	✓		Skin lesion, skin scrapings, pustular lesion swab in VTM, external parasites (70% alcohol)	Liver, kidney, any lesions
Sudden death	✓	✓	✓	✓	Brain, liver, kidney, heart, skeletal muscle, lymph nodes, any lesions	Fluid from body cavities, bone marrow, aqueous humour, any suspect toxins

Differential diagnosis for syndromes seen in cattle

	Exotic	Endemic	NABS exclusion testing
Ill thrift	<ul style="list-style-type: none"> • Surra • Haemorrhagic septicaemia • Jembrana 	<ul style="list-style-type: none"> • Bovine Viral Diarrhea Virus (BVDV-1) • Worms and Coccidiosis • Tick fever (babesiosis and anaplasmosis) 	Surra - CATT, ELISA, PCR
Neurological	<ul style="list-style-type: none"> • Bovine Spongiform Encephalopathy • Rabies • Heartwater 	<ul style="list-style-type: none"> • Botulism • Bovine Herpes Virus (BHV- 5) • Toxicity • Ketosis and Fatty liver syndrome 	BSE - Histology
Oral Lesions	<ul style="list-style-type: none"> • Foot and Mouth Disease • Vesicular stomatitis • Bluetongue, exotic serotypes • Jembrana 	<ul style="list-style-type: none"> • Mucosal disease (BVDV-1) • Bovine Malignant Cattarrh Fever • Bovine papular stomatitis • Non-infectious causes such as trauma 	FMD – ELISA & PCR VS – VNT, virus isolation (referral)
Reproductive	<ul style="list-style-type: none"> • Bovine brucellosis • Bovine Viral Diarrhoea Virus (BVDV-2) • Infectious pustular vulvovaginitis • Bovine Herpesvirus, exotic serotype 	<ul style="list-style-type: none"> • Vibriosis • Trichomoniasis • Bovine Viral Diarrhoea Virus (BVDV-1) • Leptospirosis • Akabane 	Brucellosis – RBT, CFT, PCR, Culture
Respiratory signs	<ul style="list-style-type: none"> • Contagious Bovine Pleuropneumonia • Bovine tuberculosis • Bluetongue, exotic serotypes • Bovine Herpesvirus, exotic serotypes 	<ul style="list-style-type: none"> • Shipping fever – Bovine Respiratory Disease • Infectious Bovine Rhinotrachitis (BHV-1.2b) • Bovine Ephemeral Fever • Pneumonia 	CBPP – Histology, PCR, Culture TB – Histology, PCR, Culture
Skin lesions	<ul style="list-style-type: none"> • Lumpy skin disease • Bluetongue, exotic serotypes • Aujeszky's • Surra • Screw Worm Fly • Haemorrhagic septicaemia 	<ul style="list-style-type: none"> • Bovine Herpes Virus (BHV-2) • Bovine papillomavirus (Warts) • Photosensitisation • Ringworm • Mange (<i>Chorioptes bovis</i> or <i>Demodex bovis</i>) • Irritation from cattle tick or buffalo fly 	LSD – Histology, EM microscope
Sudden death	<ul style="list-style-type: none"> • Haemorrhagic Septicaemia • Rinderpest • Bovine Theileriosis • Foot and Mouth Disease (young calves) 	<ul style="list-style-type: none"> • Botulism • Tick fever (babesiosis and anaplasmosis) • Toxicity • Tetanus • Anthrax 	HS – PCR, Culture

Handling samples in the field

- Ensure all samples are taken prior to giving treatments
- Ensure enough samples are collected to represent the whole herd
- Collect fresh and fixed samples first, then gut samples
- Label samples as soon as you take them
- Ensure labelling is clear and indelible
- Tissue samples should be prepared as both fresh and fixed
- Use plenty of 10% formalin to fix tissues
- Fix for 24 hours then formalin can be drained off for transport. Add a few mls of formalin to the container, or wrap tissue in paper towel moistened with formalin, and place in leak proof container
- Clean any surface contamination from tubes and containers
- Place tubes/vials in to zip-lock bags to keep them clean and contained together
- Keep samples cool while in the field
- Don't leave samples standing in the sun while working
- Use an esky and ice bricks to store samples.



Ill thrift

Clinical signs

- depressed animals
- weight loss or failure to gain weight
- emaciation
- sudden losses in production
- weakness
- lethargy
- oedema in lower parts of body
- swollen lymph nodes
- death

Samples to collect

- acute and convalescent blood samples for serology
 - collect in clot tubes and EDTA
- blood smears
- tissue samples of any lesions found
- tissue samples from dead animals – lymph nodes, liver, kidneys, heart, lung, spleen, GIT
- faeces
- urine

Remember to ask

- How long have the animals been affected?
- What proportion of animals are affected?
- Are other species affected, what are they?
- Have any animals been introduced to the property?
- Have any animals been removed from the property?
- Have you had a problem with biting flies?



Weight loss in cattle

Neurological signs

Clinical signs

- behavioural changes
- unusual vocalisation
- unusual posture and gait
- puritis and self-trauma
- weakness
- ataxia
- paralysis

Samples to collect

- acute and convalescent blood samples for serology
 - collect in clot tubes and EDTA
- blood smears
- tissue samples of any lesions found
- tissue samples from dead animals – liver, kidneys, brain, spinal cord, heart, spleen
- aqueous humour
- smears of brain, vascular tissue and spleen
- fluid from body cavities
- rumen and intestinal contents
- faeces
- urine

Remember to ask

- How long have the animals been affected?
- What proportion of animals are affected?
- Are other species affected, what are they?
- Have any animals been introduced to the property?
- Have any animals been removed from the property?
- Has there been any recent rainfall?
- Have animals had access to a dump?
- Has any new equipment or feed been brought onto the property?



Paralysis in cattle

Oral lesions and Vesicular diseases

Clinical signs

- unwillingness to eat
- excess salivation
- depressed animals
- vesicles/erosions/ulcerations in the mouth
- Check if animals also present with:
 - lameness
 - reluctance to move
 - similar lesions on the feet or the teats

Samples to collect

- vesicular fluid – from un-ruptured vesicles collect via a syringe or a swab and place in plain sterile tube
- nasal, oral and tonsillar swabs
- place swabs in 0.5ml of phosphate buffered saline or viral transport media
- epithelium from un-ruptured vesicles
- epithelial tags from freshly ruptured vesicles: 1–2 cm
- oropharyngeal fluid, collected with a probang, if this is available
- acute and convalescent blood samples for serology
 - collect in clot tubes and EDTA
- tissue samples from dead animals – lymph nodes, spleen, heart, liver, lung

Remember to ask

- How long have the animals been affected?
- What proportion of animals are affected?
- Are other species affected, what are they?
- Have any animals been introduced to the property?
- Have any animals been removed from the property?
- Has any new equipment or feed been brought onto the property?
- Have there been visitors to the property recently?
- Has anyone who has contact with the animals been overseas recently?



Lesions in the mouth of a cow with FMD

Reproductive signs

Clinical signs

- low pregnancy rate
- low calving rate, branding rate
- abortion
- stillborn calves
- weak calves
- retained placentas

Samples to collect

- blood samples from live animals for serology
 - collect in clot tubes and EDTA
- swabs from placenta or foetus
- swab of uterine discharge
 - place swabs in 0.5ml of phosphate buffered saline or viral transport media
- whole placenta or foetus chilled
- tissue samples from foetus– liver, kidneys, lung, brain, heart

Remember to ask

- Do you pregnancy test your herd?
- What is your pregnancy testing, calving and/or branding rate?
- Have you noticed any aborted fetuses in the paddocks or yards?
- Have you noticed any deformed calves?
- Do you vaccinate for reproductive diseases?
- Do you run heifers and cows separately?
- Have you introduced new bulls to the property and how have they been managed?
- Do you have significant problems with wild dogs?



Cattle with healthy calves

Respiratory signs

Clinical signs

- coughing
- rapid respiration
- nasal discharge
 - mucopurulent
 - frothy
 - bloody
- submaxillary lymph node abscess (horses)
- respiratory distress
- conjunctivitis

Samples to collect

- nasal, oral and tonsillar swabs
- swabs from lesions
- place swabs in 0.5ml of phosphate buffered saline or viral transport media
- Place swabs for bacteriology in transport media
- acute and convalescent blood samples for serology
- collect in clot tubes and EDTA
- tissue samples of any lesions found
- tissue samples from dead animals – lymph nodes, liver, kidneys, pleural fluid, spleen

Remember to ask

- How long have the animals been affected?
- What proportion of animals are affected?
- Are other species affected, what are they?
- Have any animals been introduced to the property?
- Have any animals been removed from the property?
- Has there been movement of cattle around the property?
- Have the animals been transported recently?
- Are there any wild/ferral animals which could contact stock?



Difficulty breathing

Skin Lesions

Clinical signs

- depressed animals
- maggots in wounds or openings such as eyes
- cutaneous nodules – may become necrotic
- enlarged lymph nodes
- oedema in limbs and ventral parts of body
- scratching and itching
- loss of hair

Samples to collect

- acute and convalescent blood samples for serology
 - collect in clot tubes and EDTA
- nasal, oral and tonsillar swabs
- place swabs in 0.5ml of phosphate buffered saline or viral transport media
- skin scrapings at site of lesions and adjacent tissue
- crusts, scabs and swabs from lesions
- any external parasites found (in 70% alcohol)
- fresh and fixed tissue samples from dead animals - lymph nodes, kidney, liver, spleen

Remember to ask

- How long have the animals been affected?
- What proportion of animals are affected?
- Are other species affected, what are they?
- Have any animals been introduced to the property?
- Have any animals been removed from the property?
- Has any new equipment been in contact with the animals?
- Do you have problems with biting insects?



Skin lesion - bovine herpes virus

Sudden death

Clinical signs

- group of animals found dead
- death not preceded by obvious signs of disease
- animals dying in rapid succession

Samples to collect

- blood samples from live animals for serology
 - collect in clot tubes and EDTA
- swabs from any lesions found
- place swabs in 0.5ml of phosphate buffered saline or viral transport media
- tissue samples of any lesions found
- tissue samples from dead animals – lymph nodes, liver, kidneys, lung, brain, bone marrow, spleen
- fluid from body cavities
- faeces
- urine

Remember to ask

- What have weather conditions been like lately?
- How long have the animals been dying?
- What proportion of animals have died?
- Are other species affected, what are they?
- Have any animals been introduced to the property?
- Have any animals been removed from the property?
- Has any new equipment or feed been brought on to the property?
- Has anyone travelled overseas recently? To where?



Mass mortality in cattle.

Practising good biosecurity

Vehicles, clothing, footwear and equipment can all spread disease between properties

- Take cleaning equipment in your vehicle
- Include a bucket, brush, disinfectant and bin bags. Common disinfectants such as chlorine based and Virkon are effective against most infectious agents.
- Put clean overalls on over your clothes before entry
 - clean disposable or dedicated overalls
 - clean gumboots
- Wear disposable gloves to collect samples
- Establish a clean zone at the entrance to the property
- Equipment clothing and footwear that have been in contact with the dirty zone, must be cleaned or placed in bags on entry to the clean zone
- Always clean before disinfecting. Mud and dirt can prevent disinfectants from being effective.
- Pay particular attention to footwear, hands and fingernails as well as equipment used on animals.
- Collect all waste and disposable equipment in a plastic bin bag
- Remove overalls as you depart the property and place in a plastic bag

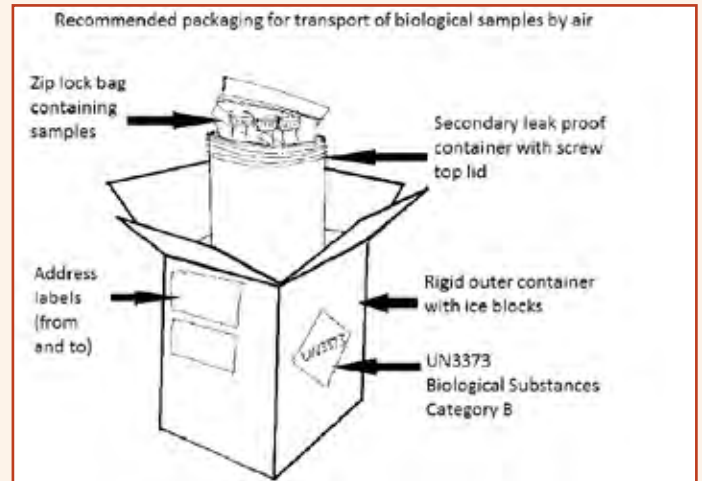
- All mud and dirt should be cleaned from your boots, including the soles.
- Once cleaned the boots should be disinfected.
- Clean vehicle on exit from the property, paying particular attention to wheel arches and tyres.



If you suspect a notifiable disease call the EAD hotline for advice before leaving the property. Do not allow animals to be moved off the property. Leave disposable equipment securely on the property for later disposal post investigation.

Packaging samples for transport

- Refrigerate samples as soon as you return from the property
- Do NOT freeze samples
- List all samples taken on the submission form
- Samples must be sent to the state veterinary diagnostic laboratory for your location as soon as practical
- Place all sample containers in zip-lock bags for transport
- Place bags of samples in a rigid container (esky/cool box)
- Use absorbent material to line container in case of leaks
- Pack all samples with ice blocks in the transport container
- Do not pack with wet ice
- Place specimen advice notice (SAN) in a separate zip lock bag
- Tape SAN to side of container
- Seal the container with tape
- If sending via courier, place the consignment note on top of the container.
- If samples are travelling by air, packing must comply with the dangerous goods regulations for
 - UN3373, Biological substances, Category B



Submitting samples and reports

Western Australia	Northern Territory	Queensland
Sample submission		
DPIRD Diagnostic Services Laboratory (DDLS)	Berrimah Veterinary Laboratories (BVL)	Specimen Receipt (Loading Dock12)
Duty Pathologist – Specimen Reception C Block 3 Baron-Hay Court, South Perth WA 6151	Makagon Road, Berrimah NT 0812	Biosecurity Sciences Laboratory (BSL) Health and Food Sciences Precinct' 39 Kessels Road , Coopers Plains Qld 4108
Email: DDLS@agric.wa.gov.au	Email: BVL@nt.gov.au	Email: BSLCLO@daf.qld.gov.au
Duty Pathologist: 08 9368 3351	Duty Pathologist: 08 8999 2249	Duty pathologist: 07 3708 8762
NABS SDI Network Contacts		
Graham Mackereth	Elizabeth Stedman	Derek Lunau
Department of Primary Industries and Regional Development (DPIRD)	Department of Primary Industry and Resources (DPIR)	Department of Agriculture and Fisheries (DAF)
08 9194 1420	08 8999 203	07 4843 2613
0477 358 066	0427 003 600	0467 814 322
NABS Vet Adviser	Kevin Bell: 0427 433 244	nabsvetadviser@gmail.com

Information correct 2018. Please check your state department website for your current SDI contact